

Chapter 14: GLM 3: Factorial designs

Labcoat Leni's Real Research

Don't forget your toothbrush?

Problem

Davey, G. C. L., et al. (2003). *Journal of Behavior Therapy & Experimental Psychiatry*, 34, 141–160.



We have all experienced that feeling after we have left the house of wondering whether we remembered to lock the door, close the window, or remove the bodies from the fridge in case the police turn up. This behaviour is common; however, people with obsessive compulsive disorder (OCD) tend to check things excessively. They might, for example, check whether they have locked the door so often that it takes them an hour to leave their house.

One theory suggests that this checking behaviour is caused by a combination of the mood you are in (positive or negative) interacting with the rules you use to decide when to stop a task (do you continue until you feel like stopping, or until you have done the task as best you can?). Davey, Startup, Zara, MacDonald, and Field (2003) tested this hypothesis by putting people into a negative, positive or no mood (**Mood**) and then asking them to generate as many things as they could that they should check before going on holiday (**Checks**). Within each mood group, half of the participants were instructed to generate as many items as they could, whereas the remainder were asked to generate items for as long as they felt like continuing the task (**Stop_Rule**). The data are in the file **Davey(2003).sav**.

Draw an error bar chart of the data and then conduct the appropriate analysis to test Davey et al.'s hypotheses that (1) people in negative moods who use an 'as many as can' stop rule would generate more items than those using a 'feel like continuing' stop rule; (2) people in a positive mood would generate more items when using a 'feel like continuing' stop rule compared to an 'as many as can' stop rule; (3) in neutral moods, the stop rule used won't have an effect.

Solution

To do an error bar chart for means that are independent (i.e., have come from different groups) we need to double-click on the clustered bar chart icon in the Chart Builder (see the book chapter). All we need to do is to drag our variables into the appropriate drop zones.

Select **Checks** from the variable list and drag it into ; select **Mood** from the variable list and drag it into ; finally, select the **Stop_Rule** variable and drag it into . This will mean that lines representing males and females will be displayed in different colours. Select error bars in the *properties* dialog box and click on to apply them to the Chart Builder. Click on to produce the graph.

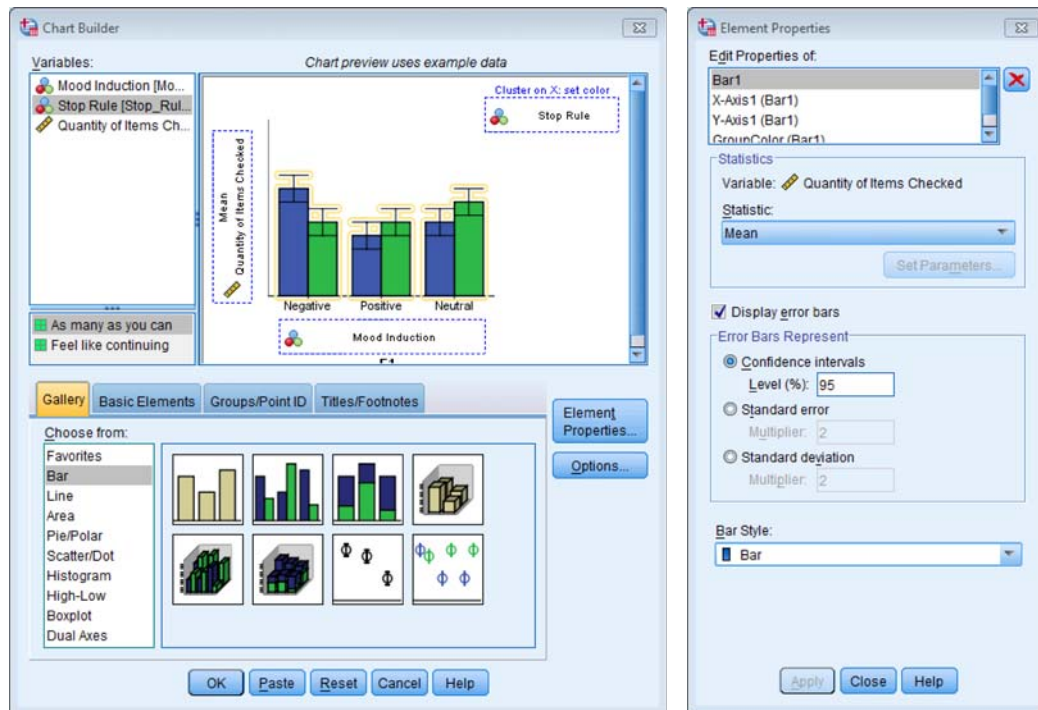


Figure 2

The resulting graph should look like [Figure Figure 3](#).

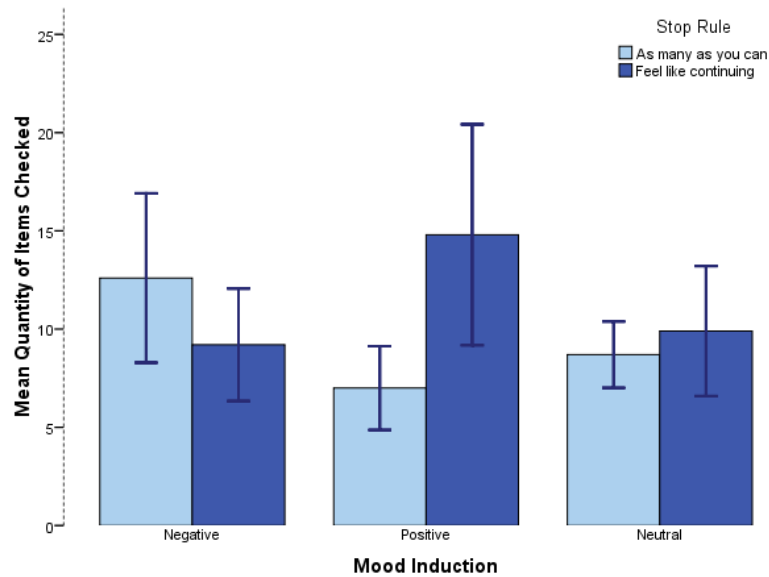


Figure 3

To access the main dialog box for a general factorial ANOVA, select **Analyze** **General Linear Model** **Univariate...**. First, select the dependent variable **Checks** from the variables list on the left-hand side of the dialog box and drag it to the space labelled *Dependent Variable*. In the space labelled *Fixed Factor(s)* we need to place any independent variables relevant to the analysis. Select **Mood** and **Stop_Rule** in the variables list (these variables can be selected simultaneously by holding down *Ctrl* while clicking on the variables) and drag them to the *Fixed Factor(s)* box.

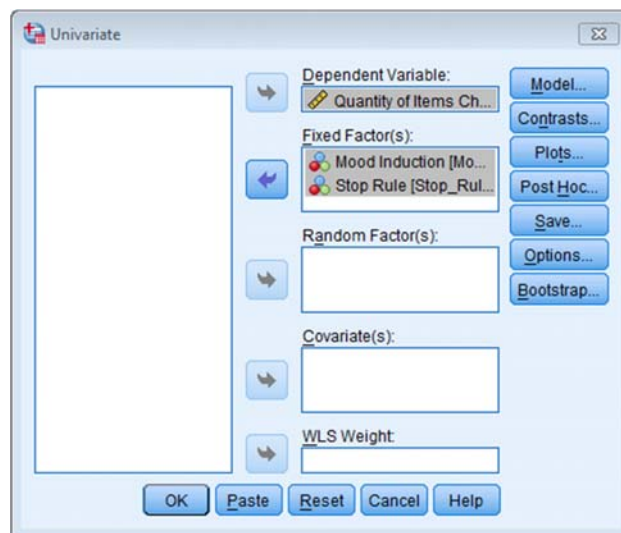


Figure 4

The resulting output can be interpreted as follows (see Output 5). First, Levene's test is significant, indicating a problem with homogeneity of variance. If we compare the largest and smallest variances (smallest = $2.35^2 = 5.52$; largest = $7.86^2 = 61.78$) we find a ratio of $61.78/5.52 = 11$. We have six variances, and $N - 1 = 9$, and so the critical value from Hartley's table (which you can find in the web material for Chapter 6) is 7.80. Our observed value of 11 is bigger than this, so we definitely have a problem.

Descriptive Statistics

Dependent Variable: Quantity of Items Checked

Mood ...	Stop Rule	Mean	Std. Deviation	N
Negative	As many as you can	12.6000	6.02218	10
	Feel like continuing	9.2000	3.99444	10
	Total	10.9000	5.27057	20
Positive	As many as you can	7.0000	2.98142	10
	Feel like continuing	14.8000	7.85706	10
	Total	10.9000	7.03300	20
Neutral	As many as you can	8.7000	2.35938	10
	Feel like continuing	9.9000	4.62961	10
	Total	9.3000	3.62883	20
Total	As many as you can	9.4333	4.62887	30
	Feel like continuing	11.3000	6.09777	30
	Total	10.3667	5.44920	60

Levene's Test of Equality of Error Variances^a

Dependent Variable: Quantity of Items Checked

F	df1	df2	Sig.
2.919	5	54	.021

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

a. Design: Intercept + Mood + Stop_Rule + Mood * Stop_Rule

Tests of Between-Subjects Effects

Dependent Variable: Quantity of Items Checked

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	403.333 ^a	5	80.667	3.230	.013
Intercept	6448.067	1	6448.067	258.190	.000
Mood	34.133	2	17.067	.683	.509
Stop_Rule	52.267	1	52.267	2.093	.154
Mood * Stop_Rule	316.933	2	158.467	6.345	.003
Error	1348.600	54	24.974		
Total	8200.000	60			
Corrected Total	1751.933	59			

a. R Squared = .230 (Adjusted R Squared = .159)

Output 5

The main effect of mood was not significant, $F(2, 54) = 0.68$, $p = .51$, indicating that the number of checks (when we ignore the stop rule adopted) was roughly the same regardless

of whether the person was in a positive, negative or neutral mood. Similarly, the main effect of stop rule was not significant, $F(1, 54) = 2.09, p = .15$, indicating that the number of checks (when we ignore the mood induced) was roughly the same regardless of whether the person used an 'as many as can' or a 'feel like continuing' stop rule. The mood \times stop rule interaction was significant, $F(2, 54) = 6.35, p = .003$, indicating that the mood combined with the stop rule significantly affected checking behaviour. Looking at the graph, a negative mood in combination with an 'as many as can' stop rule increased checking, as did the combination of a 'feel like continuing' stop rule and a positive mood, just as Davey et al. predicted.